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Science 4

Plant Growth and Changes

Home Instructor's Guide and Assignment Booklet 4A

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Alberta
EDUCATION

Learning
Technologies
Branch

Science 4
Module 4: Plant Growth and Changes
Home Instructor's Guide and Assignment Booklet 4A
Learning Technologies Branch
ISBN 0-7741-2872-0

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The Learning Technologies Branch acknowledges with appreciation the Alberta Distance Learning Centre and Pembina Hills Regional Division No. 7 for their review of this Home Instructor's Guide and Assignment Booklet.

This document is intended for	
Students	✓
Teachers	✓
Administrators	
Home Instructors	✓
General Public	
Other	

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- Learning Technologies Branch, **http://www.education.gov.ab.ca/ltb**
- Learning Resources Centre, **http://www.lrc.education.gov.ab.ca**

Exploring the electronic information superhighway can be educational and entertaining. However, be aware that these computer networks are not censored. Students may unintentionally or purposely find articles on the Internet that may be offensive or inappropriate. As well, the sources of information are not always cited and the content may not be accurate. Therefore, students may wish to confirm facts with a second source.

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Module 4: Plant Growth and Changes

Overview

In this module, your student will begin by thinking about how he or she uses plants and the importance of plants in the day-to-day lives of all people. He or she will investigate the conditions that plants need to grow. Your student will look closely at the parts of a plant, including flowers and seeds. With each lesson, there are hands-on activities to help your student understand the concepts presented. It is important that you look over the additional required materials for each lesson before your student begins each module, in case anything needs to be acquired ahead of time.

Your student may have to wait several days to see the results from some of the activities. You should read through all of the activities to see which ones ask your student to grow plants or germinate seeds. Help keep your student organized so that he or she completes the activities. In some cases your student will have to remember to go back to review the growth of his or her plants. There are additional hands-on activities in the Optional Follow-up Activities at the end of each section of this module.

Your student should plant one or more of the bean seeds that he or she sprouted in Lesson 1. Your student needs to monitor the growth of a plant from seed to flower and, perhaps, even to the point where it produces seeds. Monitor the growth of the plant over a period of time. This activity may well run far past the end of the other work in this module.

There are several links to Internet sites throughout this module. You may want to look at the sites with your student. As well, there are ideas for more activities if your student is particularly keen. For good general science sites, you may want to start at the website for the Science Alberta Foundation. There are links for teachers and children at this site.

http://www.sciencealberta.org

The explOratorium site and the Community Learning Network site also have many good activities.

- **http://www.exploratorium.com**
- **http://www.cln.org**

The website Kids Gardening has helpful information for both you and your student.

http://www.kidsgardening.com

Excellent print resources include *Plants* by the Ontario Science Centre (Toronto: Kids Can Press, 1994) and *The Kids Canadian Tree Book* (Toronto: Kids Can Press, 1995) and *Kids Canadian Plant Book* (Toronto: Kids Can Press, 1996) by Pamela Hickman. Lois Hole was a well-known and respected Alberta gardener. Her books, *Lois Hole's Tree and Shrub Favourites* (Edmonton: Lone Pine Publishing, 1997), *Lois Hole's Rose Favourites* (Edmonton: Lone Pine Publishing, 1997), and others in this series, may also be useful.

Plant types and various biomes (ecological communities) can be further explored by a visit to the following:

- a local greenhouse (Generally, the best plants for the region are shown.)
- the Muttart Conservatory in Edmonton (Students can view a tropical biome, a desert biome, and a temperate biome. A feature pyramid showcases the flowers of the season.)
- the John Janzen Nature Centre (This site is very student-friendly. Your student can explore the natural parkland of the Edmonton area. Activities here also tie-in well to the next module's environmental topics.)

- the Devonian Botanical Gardens, a branch of the University of Alberta near Devon, Alberta (The Devonian Gardens have excellent outdoor as well as indoor examples of various types of biomes and the plants that grow there.)

Notes to the Home Instructor

This booklet contains the following components for you and your student:

1. Home Instructor's Guide

These are notes for you. First, there is an overview, a listing of suggested websites, and a listing of additional required materials needed for the section. Then, there is an overview of the content, activities, learning outcomes, and special requirements of each lesson in the section.

Note: To ensure that you have all of the materials on hand for your student to complete the activities for each module, read through the list of materials required for the lessons. They are boxed for easy reference, as shown in the following example.

Activity 1: Growing a Bean Plant

- 4 dried beans (from a seed packet)
- 4 pieces of paper towel
- 4 saucers or pie plates
- 4 pieces of paper, slightly smaller than the saucers
- a plastic container or a small potting container
- soil
- a nail (if a potting container isn't used)

2. Assignment Record Form

This is a form to send in with the assignments. Remember to paste the address label provided by your school on it. The teacher will keep track of your student's assignments, record your student's grades, and include his or her comments using this form.

3. Assignment

Your student should answer all questions in complete sentences where possible. Questions set up as lists, tables, charts, or graphs do not need sentence answers. Send the assignment to the teacher as soon as the booklet has been completed.

4. Home Instructor Feedback Form and Student Feedback Form

You and your student should complete these forms. Send them in at the same time as the assignment. They provide us with helpful information about what we are doing right and what needs to be changed.

5. Checklist

The checklist helps you confirm that all of the required components have been collected prior to submitting the completed work to the teacher. For students completing this module electronically, this checklist also includes spaces to indicate the method of submitting graphs, drawings, or photos of assignment work where required.

Section 1: Understanding Plants

Overview

In this section, your student will study the parts of plants, and the role each part plays in the growth and health of the plant. He or she will discover what plants need to survive. Your student will be investigating the conditions that plants need to grow. With each lesson there are hands-on activities to help your student understand the concepts presented.

Although each lesson can be completed within an hour, sometimes your student will have to wait several days to see the results of an activity. You may want to read through all of the activities to see which ones ask your student to grow plants or germinate seeds. Help your student become organized so that he or she remembers to go back to review the growth of his or her plant and complete the activities. The fourth lesson involves growing a plant from seed through to reproducing seeds. Your student could use the bean plant from Lesson 1 for this activity. This will take longer than the time allotted to this module. Your student will need to continue with the activity after the module is complete.

It is important that you look over the additional required materials for each lesson before your student begins each module, in case anything needs to be acquired ahead of time.

Assessment and Feedback

The feedback you and your student provide in the feedback forms will assist the teacher in assessing your student's progress.

The Section 1 Assignment is worth 74 marks out of a total 127 marks for this module.

Websites Mentioned in Module 4: Section 1

It is recommended that you check these websites prior to your student beginning work on this section.

Lesson 1

- the Missouri Botanical Garden
  http://mbgnet.mobot.org

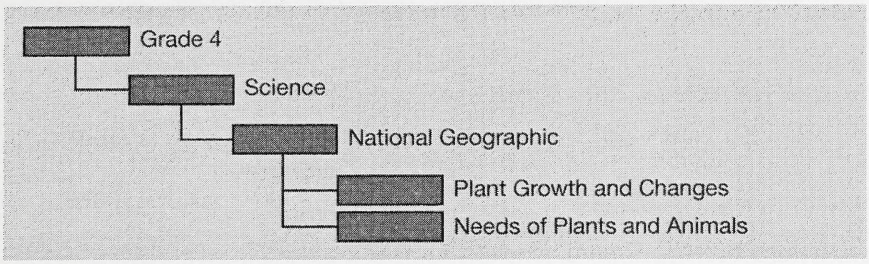
Lesson 3

- Biomes of the World (sponsored by the Missouri Botanical Garden)
  http://mbgnet.mobot.org

- Kids Gardening (sponsored by the National Gardening Association)
  http://www.kidsgardening.com

Lesson 4

- National Geographic videos (from LearnAlberta)
  http://www.learnalberta.ca



Lesson 5

- Kids Gardening
  http://www.kidsgardening.com

- Meet the Plant Parts and Build a Salad
  http://www.hhmi.org/coolscience/vegquiz/index.html

Optional Follow-up Activities

Activity 1: Taking It Apart

- The Great Plant Escape
  http://www.urbanext.uiuc.edu/gpe/case1/c1facts2a.html

Additional Required Materials

Activity 1: Growing a Bean Plant

- 4 dried beans (from a seed packet)
- 4 pieces of paper towel
- 4 saucers or pie plates
- 4 pieces of paper, slightly smaller than the saucers
- a plastic container or a small potting container
- soil
- a nail (if a potting container isn't used)

Activity 2: Mystery Travel

- a small spoon
- some food colouring (red or blue) or brightly-coloured drink crystals (Do not use yellow or green colours.)
- a clear glass filled to a depth of at least 2 to 3 cm of water
- a table knife
- a celery stalk (with its leaves, if possible)

Activity 3: Smelling the Flowers

- 2 flowers (the same kind and preferably large blooms)
- a cotton ball or Q-Tip™ (Roll up a small bit of the cotton ball and hold it in tweezers for more control.)
- a magnifying glass
- microscope (optional)
- a paint shirt, apron, or other protective clothing

Activity 4: Growing Your Own Plant

- a package of seeds (dwarf marigold or another quick-growing annual seed suggested by a local greenhouse)
- potting soil
- a small plant pot (The size depends on the plant you are going to grow. You will likely have to transplant and fertilize your plant before it reaches maturity.)

Activity 5: Perfect Conditions

- a tablespoon
- 4 small, self-closing sandwich bags
- 4 spoonfuls of one type of seed (alfalfa seeds, radish seeds, raw sunflower seeds) or mung beans
- masking tape
- a felt pen
- water and a small bowl

Activity 6: Growing a Carrot

- an old carrot that has started to sprout green leaves
- a clear plastic cup with a hole in the bottom
- a saucer or tin pie plate (to catch excess water)
- soil
- a knife

Optional Follow-up Activities

Activity 1: Taking It Apart

- a flowering plant that can be dug up and cut up

Activity 2: Growing a Beanstalk

- your planted bean seed from Lesson 3
- a bigger pot
- potting soil

Activity 3: Planting Your Own Garden

- seeds, cuttings, and/or potted plants
- space for a garden
- hoe, rake, trowel
- garden stakes (optional)
- water
- fertilizer (optional)

Activity 4: Growing Your Own Houseplants

- a lemon, grapefruit, orange, or other fruit seed **or** an avocado seed and four toothpicks
- soil
- glass (optional)
- water
- plant pot and saucer

Lesson Summaries

Lesson 1: What Plants Need

Summary

In this lesson, your student will discover that plants need light energy, air, water, nutrients, and space in order to grow. The lesson begins with a discussion of photosynthesis. If your student has difficulty with words such as *chlorophyll* and *photosynthesis*, it is enough for him or her to understand that a chemical reaction happens in the leaves when the plant is in sunlight. This reaction makes food for the plant. Your student should be clear that food is created in the leaves, and that roots absorb nutrients from the soil or water. Conditions needed by different plants are discussed.

The Internet link will provide your student with more information about different plant communities and their growing conditions. At this site, your student can choose links for different biomes, such as tropical rain forest, tundra, grassland, taiga, desert, or temperate rain forest.

In Activity 1, your student will germinate and plant bean seeds. Ensure your student uses seeds from a seed packet rather than those from a grocery store. (Bean seeds sold for food may have been treated to prevent sprouting.) Since this activity will take several days to complete, remind your student to observe the bean seeds each day. After completing this lesson, help your student plant the bean seeds in soil. Your student should care for this plant or another plant while he or she completes the module in order for him or her to nurture a plant from seed to mature plant.

Learning Outcomes

It is expected that your student will be able to

- describe the conditions plants need for growth
- germinate a seed and grow and care for a plant
- describe ways to grow new plants from seeds
- describe the growth requirements for a plant he or she has germinated and grown

Additional Required Materials

Activity 1: Growing a Bean Plant

- 4 dried beans (from a seed packet)
- 4 pieces of paper towel
- 4 saucers or pie plates
- 4 pieces of paper, slightly smaller than the saucers
- a plastic container or a small potting container
- soil
- a nail (if a potting container isn't used)

Lesson 2: Roots, Stems, and Leaves

Summary

In this lesson, your student will look at the role of roots, stems, and leaves in plants. The Internet link suggested in this lesson is a fun introduction to plant parts. Your student will build a salad using different plant parts. Challenge your student to look at the fruits and vegetables in the fridge and identify which are roots, stems, and leaves. By the end of this lesson, your student should understand what each part of the plant does. In this lesson, your student will review photosynthesis.

In Activity 2, your student will investigate how stems transport nutrients and water up through their tissues to the leaves of a celery stalk. Your student should understand that there is a lot of movement in plants. Sugar is made in the leaves and moved from there to all parts of the plant. Roots absorb nutrients and water from the soil and transport them upwards to the rest of the plant.

Learning Outcomes

It is expected that your student will be able to

- identify and describe the purpose of plant roots, stems, and leaves

Additional Required Materials

Activity 2: Mystery Travel

- a small spoon
- some food colouring (red or blue) or brightly-coloured drink crystals (Do not use yellow or green colours.)
- a clear glass filled to a depth of at least 2 to 3 cm of water
- a table knife
- a celery stalk (with its leaves, if possible)

Lesson 3: Flowers

Summary

In this lesson, your student will examine flowers. He or she will be introduced to parts of the flower and find out that there are male and female parts to a flower. Your student will also study the role of pollinators, such as insects, wind, birds, and bats. It may be helpful for your student to have several different flowers to examine while completing this lesson. In Activity 3, your student will mimic a pollinator. Try to choose large flowers with easily visible stamens and pistil. Lilies should work very well. (**Note:** Magnifying glasses are readily available at discount stores and your local pharmacies.) If you have access to a microscope, it will be fun for your student to look at a grain of pollen. If you don't have a microscope, you can find photographs of pollen in books and on the Internet.

The flowers discussed in the student module are perfect flowers—they have both male and female parts. Numerous plants have imperfect flowers—they have either male or female parts. The following websites show or discuss plants that have imperfect flowers.

- **http://www.hort.purdue.edu/ext/senior/vegetabl/pumpkin4.htm**
- **http://www.hort.purdue.edu/ext/senior/vegetabl/cucum4.htm**
- **http://www.naturenorth.com/spring/flora/pwillow/pwillow3.html**

Your student may be interested to know that many gardeners and plant breeders use cotton balls or Q-Tips™ to pollinate plants just as the student will in Activity 3. The Internet link for this activity provides excellent background information on pollination and pollinators. You may want to bookmark this site for your student. Your student may find the information on the relationship between pollinators and the shape and design of flowers particularly interesting.

Learning Outcomes

It is expected that your student will be able to

- identify and describe the purpose of plant flowers
- identify the reproductive structures of the plant

Additional Required Materials

Activity 3: Smelling the Flowers

Note: Be sure to choose "perfect flowers" so your student can find both male and female parts.

- 2 flowers (the same kind and preferably large blooms)
- a cotton ball or Q-Tip™ (Roll up a small bit of the cotton ball and hold it in tweezers for more control.)
- a magnifying glass
- microscope (optional)
- a paint shirt, apron, or other protective clothing

Lesson 4: Your Green Thumb

Summary

In Activity 4: Growing Your Own Plant, your student will be growing a plant from seed to maturity. It will take longer than the time allotted for this lesson, or this module. Encourage your student to continue with the activity after the lesson is complete. If your student keeps notes on the progress of his/her plant as it grows, then he/she can write a report for an optional activity at the end the module.

Although your student will be growing a few different plants in this section, this is the only lesson where a plant is taken from seed to maturity.

Learning Outcomes

It is expected that your student will be able to

- nurture a plant through one complete life cycle—from seed to seed
- describe the care and growth of a plant that he/she has nurtured, in particular to identify the light, temperature, water, and growing medium requirements of the plant

Additional Required Materials

Activity 4: Growing Your Own Plant

- a package of seeds (dwarf marigold or another quick-growing annual seed suggested by a local greenhouse)
- potting soil
- a small plant pot (The size depends on the plant you are going to grow. You will likely have to transplant and fertilize your plant before it reaches maturity.)

Lesson 5: Life Cycles

Summary

In this lesson, your student will look more closely at seeds and seed germination. In Activity 5, your student will place seeds in different environments to determine the best conditions for germination. As an extension, your student could save seeds he or she finds in food at home (orange, grape, lemon, apple, pear, avocado, etc.) and try sprouting them. Your student will also discover the difference between annuals and perennials. You may want to take your student to a garden or garden centre to identify the annuals and perennials. You may also want to show him or her where seeds can be found in common plants (for example, in an apple, pea pod, etc.) and how seeds develop from fertilized flowers.

Learning Outcomes

It is expected that your student will be able to

- describe the general life cycle of plants
- describe ways to grow new plants from seeds

Additional Required Materials

Activity 5: Perfect Conditions

- a tablespoon
- 4 small, self-closing sandwich bags
- 4 spoonfuls of one type of seed (alfalfa seeds, radish seeds, raw sunflower seeds) or mung beans
- masking tape
- a felt pen
- water and a small bowl

Lesson 6: Starting Plants

Summary

In this lesson, your student will look at ways to grow new plants other than from seeds. He or she will find out about cuttings, runners, and bulbs. Many plants grow in this way. If possible, your student could try to identify plants that grow from cuttings, runners, and bulbs in his or her garden or neighbourhood. Plants that are started and grown in this way are genetically identical to their parents. New plants started by pollination are genetically different from their parents. In Activity 6, your student will start and grow a new plant from a carrot top, which is a cutting.

Learning Outcomes

It is expected that your student will be able to

- describe ways to grow new plants from cuttings, bulbs, and/or runners.

Additional Required Materials

Activity 6: Growing a Carrot

Note: You will need to help your student cut off the top of the carrot.

- an old carrot that has started to sprout green leaves
- a clear plastic cup with a hole in the bottom
- a saucer or tin pie plate (to catch excess water)
- soil
- a knife

ASSIGNMENT BOOKLET 4A

Science 4
Module 4: Section 1 Assignment

Home Instructor's Comments and Questions

_____
Home Instructor's Signature

FOR SCHOOL USE ONLY

Assigned Teacher:

_____

Date Assignment Received:

_____

Grading:

_____

Additional Information:

_____

_____

_____

_____

_____

_____

_____

_____

FOR HOME INSTRUCTOR USE
(if label is missing or incorrect)

Student File Number:

_____

Date Submitted:

_____

Apply Module Label Here

Name

Address

Postal Code

Please verify that preprinted label is for correct course and module.

Teacher's Comments

_____
Teacher's Signature

Home Instructor: Keep this sheet when it is returned to you as a record of the student's progress.

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- Are all the assignments completed? If not, explain why.
- Has your work been reread to ensure accuracy in spelling and details?
- Is the booklet cover filled out and the correct module label attached?

MAILING

1. Do **not** enclose letters with your Assignment Booklets. **Send all letters in a separate envelope.**

2. Put your Assignment Booklet in an envelope and take it to the post office and have it weighed. Attach **sufficient postage** and seal the envelope.

FAXING

1. Assignment Booklets may be faxed to the school with which you are registered. Contact your teacher for the appropriate fax number.

2. All faxing costs are the responsibility of the sender.

E-MAILING

It may be possible to e-mail your completed Assignment Booklet to the school with which you are registered. You also may be **required** to e-mail some of your assignments. Contact your teacher for the appropriate e-mail address.

Science 4

Plant Growth and Changes

Assignment Booklet 4A

4

Alberta
EDUCATION

Learning
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Branch

FOR TEACHER'S USE ONLY

Summary

	Total Possible Marks	Your Mark
Lesson 1 Assignment	16	
Lesson 2 Assignment	12	
Lesson 3 Assignment	18	
Lesson 4 Assignment	11	
Lesson 5 Assignment	8	
Lesson 6 Assignment	9	
	74	

Teacher's Comments

Science 4
Module 4: Plant Growth and Changes
Assignment Booklet 4A
Learning Technologies Branch

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The Learning Technologies Branch acknowledges with appreciation the Alberta Distance Learning Centre and Pembina Hills Regional Division No. 7 for their review of this Assignment Booklet.

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Students	✓
Teachers	✓
Administrators	
Home Instructors	✓
General Public	
Other	

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- Learning Technologies Branch, **http://www.education.gov.ab.ca/ltb**
- Learning Resources Centre, **http://www.lrc.education.gov.ab.ca**

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ASSIGNMENT BOOKLET 4A
SCIENCE 4: MODULE 4
SECTION 1 ASSIGNMENT

This Assignment Booklet is worth 74 marks out of the total 127 marks for the assignments in Module 4. The value of each assignment and each question is stated in the left margin.

Read all parts of your assignment carefully and record your answers in the appropriate places. If you have difficulty with an assignment, go back to your Student Module Booklet and review the appropriate lesson. Be sure to proofread your answers carefully before submitting your Assignment Booklet.

Note: If you are using electronic assignments, you will need to do the following:

- You need to print the pages that ask you to make a drawing. You will find them in your PDF file.
- You will need to mail your drawings to your teacher.

(74)

Section 1 Assignment: Understanding Plants

1. Answer the following questions about what plants need.

(6)

a. What 5 things do all green plants need for growth?

_____

_____

_____

_____

_____

_____

(4) b. Explain 3 ways that you can improve conditions to help plants grow better.

(3) c. Think about a plant growing in the shade. Now, think about a plant growing in bright sunlight. In what ways may these plants be different?

(3) d. Think about a plant growing in a desert. Now, think about a plant growing in a rain forest. In what ways may these plants' needs be different?

Your teacher is looking for

- how well you understand what plants need to grow (5 marks—1 mark for each correct response; 3 marks—1 mark for each improvement; 2 marks each for a correct different need)
- answers in complete sentences (1 mark each)

When you are ready, turn to Lesson 2 in your Student Module Booklet.

(5) 2. a. Draw a picture of a bean plant. Label the roots, stems, and leaves.

Your teacher is looking for

- a neatly drawn diagram (2 marks)
- printed labels that name each part of the plant (3—1 mark each)

(7) b. Explain what each part of the bean plant does.

roots: _____

_____

_____

stem: _____

_____

_____

leaves: _____

_____

_____

Your teacher is looking for

- a description of what each plant part does (2 marks each)
- answers in complete sentences (1 mark)

When you are ready, turn to Lesson 3 in your Student Module Booklet.

(7) 3. a. Draw and label a picture to show how pollination happens.

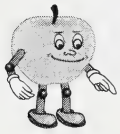
Your teacher is looking for

- a neatly drawn diagram (2 marks)
- labelled flower parts (4 marks)
- arrows to show how pollen moves from one flower to another or within a flower (1 mark)

(11) b. Explain in sentences what your picture in (question 3.a.) shows.

Your teacher is looking for

- a complete explanation of how your picture shows that pollination is happening (10 marks)
- using complete sentences (1 mark)



When you are ready, turn to Lesson 4 in your Student Module Booklet.

(11) 4. You have begun to grow your own plant from seed and watched it as it grew. Describe the care a plant needs to grow from seed to maturity.

Your teacher is looking for

- five things your plant needed (2 marks each)
- using complete sentences (1 mark)

When you are ready, turn to Lesson 5 in your Student Module Booklet.

(2) 5. a. What is the purpose of seeds?

(3) b. What are the important parts of a seed?

(3) c. How are annuals and perennials different?

Your teacher is looking for

- answers that show how well you understand the purpose and parts of seeds (1 mark for the purpose; 2 marks for identifying the important parts of seeds)
- answers that show you understand the different types of plants (2 marks)
- answers in complete sentences (1 mark each)

When you are ready, turn to Lesson 6 in your Student Module Booklet.

6. Answer the following questions about different ways of growing plants.

(7) a. Describe how plants are grown from each of the following:

- cuttings

_____

_____

_____

- runners

_____

_____

_____

- bulbs

_____

_____

_____

(2) b. Name a plant grown from runners. _____

Name a plant grown from bulbs. _____

Your teacher is looking for

- complete descriptions about how plants are grown in different ways (2 marks each)
- answers in complete sentences in 6.a. (1 mark)
- names of plants grown from runners and bulbs in 6.b. (1 mark each)

When you are ready, turn to the Section 1 Conclusion and Optional Follow-up Activities in your Student Module Booklet.

Home Instructor Feedback Form

Module 4: Section 1

Answer the following questions and mail them in with the completed assignment for this section.

1. Was the level of vocabulary introduced in this section appropriate for your student? If your student experienced difficulty with any vocabulary, please explain.

2. Which activities were the most useful in helping your student understand the concepts explained in this section?

3. Did you encounter difficulty obtaining any of the materials necessary for the activities? If so, which items?

4. For several of the activities, your student was required to monitor the growth of seeds or plants over several days. Was this a practical approach for your student?

Please add any questions or comments you may have.

Student Feedback Form

Module 4: Section 1

Answer the following questions and mail them in with the completed assignment for this section. This is not a test, and there are no marks assigned.

1. Which was your favourite lesson in this section? Explain why you enjoyed this lesson.

_____

_____

_____

2. Describe three new things that you learned in this section about the importance of plants in our lives.

_____

_____

_____

_____

3. Several activities took more than one day to complete. Did you have trouble remembering to check your growing plants or seeds?

_____

_____

_____

4. Which Internet sites did you check out in this section? What did you learn or find interesting in them?

_____

_____

_____

Checklist for Module 4: Assignment Booklet 4A

Make sure you send in all of the following items.

- ❑ Assignment Record Form
- ❑ Assignment Booklet 4A, questions 1–6
- ❑ Home Instructor Feedback Form
- ❑ Student Feedback Form
- ❑ Optional Follow-up Activity (optional)

If you are completing your assignment electronically, advise your teacher how you are submitting the following:

Question 2.a.

_____

_____

_____

Question 3.a.

_____

_____

_____

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